

BATTLESHIP?

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Fort Leavenworth, Kansas

First Term AY 96-97

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19970505 181

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank) 2. REPORT DATE 9 Dec 1996 3. REPORT TYPE AND DATES COVERED Monograph

4. TITLE AND SUBTITLE 5. FUNDING NUMBERS

Can the Arsenal Ship Replace the Battleship? (U)

6. AUTHOR(S) Major Joseph M. Lance III, USMC

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) 8. SPONSORING OR MONITORING AGENCY NAME(S) AND REPORT NUMBER

SCHOOL OF ADVANCED MILITARY STUDIES
ATTN: ATZL-SWV
Fort Leavenworth, Kansas 66027-6900
COM (913) 758-3300 DSN 552-3300

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) 10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT 12b. DISTRIBUTION STATEMENT

Approved for public release, distribution is unlimited.

13. ABSTRACT (Maximum 200 words)

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14. SUBJECT TERMS

Arsenal Ship, Battleship, Naval Fire Support

58

UNCLASSIFIED

UNCLASSIFIED

UNCLASSIFIED

UNLIMITED

SCHOOL OF ADVANCED MILITARY STUDIES
MONOGRAPH APPROVAL

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Can the Arsenal Ship Replace the Battleship?

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First Term

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CAN THE ARSENAL SHIP REPLACE THE BATTLESHIP? by Major Joseph M. Lance III, USMC, 58 pages.

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CHAPTER ONE

INTRODUCTION

Since men live upon the land and not upon the sea, great issues between nations at war have always been decided--except in the rarest cases--either by what your army can do against your enemy's territory and national life or by the fear of what the fleet makes it possible for your army to do.

Sir Julian Corbett

If Corbett's point is still valid, naval ships should contribute to what an army can do against an enemy's territory. The U.S. Navy's proposed arsenal ship may directly support an army as a weapons delivery platform. The former Chief of Naval Operations (CNO) Admiral Mike Boorda emphatically stated, "...it's a fire support ship. It's all about providing fire support to troops ashore."¹ If the CNO's vision comes true, the arsenal ship will put more sea-based firepower at a land commander's disposal than ever before. This concept makes the arsenal ship a revolutionary vessel, and it does not fit neatly into any traditional category. Definitely not a frigate, destroyer, cruiser or aircraft carrier, the arsenal ship will not resemble any current surface combatant. It will not even resemble its closest relative, the battleship, but it must attempt to replicate the battleship's ability to provide

fire support to land forces. This paper attempts to answer the basic question, can the arsenal ship replace the battleship?

Battleships have always been synonymous with big guns. When the British executed the first modern amphibious assault at Gallipoli, the battleship *Albion's* big guns pounded coastal fortifications and set an enduring precedent.² The American battleship experience culminated during World War II with the Iowa class ships. Congress authorized six Iowas as a counter to the German *Bismarck* and the Japanese *Yamato*. Although only four Iowas saw service, the U.S. Navy's battleship fleet provided invaluable gunfire support to landing forces and to land forces operating along or near a coastline. Most of the battleship fleet went out of commission after World War II, but the Iowas returned to service whenever the nation called. They fired during both the Korean and Vietnam conflicts and they returned again in 1983 as the growing Navy recognized a continuing need for their unique capabilities. Finally in 1991, the Navy decommissioned all four ships for what was intended to be the last time.³ The Iowas left the active inventory, but the need for their capabilities did not diminish.

With Desert Storm completed and the Soviet Union in the process of dismantling itself, the Navy could take the

time to assess the future and revise its course and speed.

...*From the Sea* was the Navy's 1992 approach to an uncertain future and a rapidly changing world situation. Without an immediate blue water open ocean challenge, the Navy redirected itself toward the brown water littorals. ...*From the Sea* emphasized the Navy's contributions to forces coming from the sea onto the land projecting power. The new approach acknowledged the landing forces required surface fire support, but there was no credible Navy response as to how to provide that support. Forced by fiscal reality to reduce its size, the Navy believed it could not afford to man or support the battleships any longer. Minus the Iowas, the only remaining naval guns were the short range 5-inch and 3-inch guns of the traditional surface combatants--the frigates, cruisers and destroyers. The short range guns were less than ideal because they could barely range into the landing force's area of operations. The Navy also needed to keep the surface combatants in the carrier battlegroups to protect the carriers. So, for many reasons, all of them important to the Navy, the naval gunfire mission went begging.

In 1994, the Navy followed ...*From the Sea* with *Forward...From the Sea*. It reaffirmed the primacy of littoral operations, but it failed to address the obvious

discrepancy between the focus on the littorals and the lack of gunfire support necessary to succeed there. Traditional carrier-based, land-based and expeditionary air support could attempt to fill the gunfire gap, but there will never be enough airplanes to ensure continuous close support for committed ground forces. Battleships, or something with a battleship's capabilities were still necessary components of littoral warfare. After a year's debate and amid sharp questioning from Congress, the Navy began to respond to its critics. The arsenal ship concept emerged throughout 1995, and in May of 1996 the Navy released the concept of operations and ship capabilities documents.⁴ The proposed arsenal ship will be an impressive delivery platform with high technology missiles and stealthy design. It appears to be the Navy's preferred response to the obvious shortfall in surface fire support for troops ashore, but can the arsenal ship fill the void left by the Iowa class battleships?

To evaluate the arsenal ship, this paper begins by examining the history and legacy of the battleships. The story of the battleship is long, but it is crucial to any study of the arsenal ship. To understand the debate surrounding the arsenal ship, even the most casual reader must be familiar with the history of the battleship. After tracing the battleship story, then the development of the arsenal ship can begin. The arsenal ship's genesis, its

required capabilities, the proposed concept of operations, and its postulated performance help frame the basic question and provide a basis for comparison. The paper's conclusion summarizes the findings and the current debate while answering the practical question, what does this study tell us and why is it worth knowing?

CHAPTER TWO

THE BATTLESHIP

The battleship became the one accepted symbol of naval power throughout the world; and, because of both strategic and diplomatic implications inherent in a ship of such aggressive potential, it became the most controversial and publicly discussed type of ship in the United States. Brayton Harris

Maritime nations have always employed sea power to protect their commerce and project their power. Sea power required nations to invest in fighting ships.

"The fighting ships evolved into fleets. These have always needed heavyweight champions, powerful warships in the front line of battle that can hit the hardest and take the most punishment--for war demands the ability to take as well as to give."⁵

The epitome of the fighting ship was the battleship. A seafaring nation identified with and was identified by its ships-of-the-line. American esteem and historical significance revolved around the early "Frigate Navy," the *Monitor*, the *Maine*, the Great White Fleet, Battleship Row at Pearl Harbor, and the culmination of the battleship line with the Iowa class ships. These proud warriors had their beginnings in the galleys of ancient Phoenicia.⁶

The Phoenicians controlled the eastern half of the Mediterranean from 1100 to 800 BC. To extend their economic prosperity, the Phoenicians built two distinct classes of ships. The "round ships" carried the bulk of the trade, and the "long ships" fought when necessary. The earliest battleship was easily recognizable by its narrow, menacing appearance capped by a long ram. The embarked archers and spearmen provided the "long ship" with the ability to engage enemies from a distance if ramming was not feasible. The "long ship" eventually gave way to faster, more maneuverable biremes and triremes. By 500 BC, the trireme, a galley with three tiers of rowers on each side of the centerline, ruled the Mediterranean Sea. Seaworthy but fragile, it set the standards for naval warfare for the next 2000 years.⁷

Ship design steadily evolved, but naval tactics languished. Even the addition of rudimentary cannons in the 15th Century did not change the basic tactical maneuvers. However, the 16th Century saw a great interest in maritime affairs as the major European powers rushed to expand their empires. The lure of untapped riches provided the impetus to expand and improve the navies of the day. The galleys grew into galleons, and soon ocean-going vessels bristled with cannons.⁸ Spain, Portugal, England, France and Holland competed for glory, conquest and wealth.

Great Britain seized the command of the sea from Spain in 1588 by defeating the Spanish Armada. The English admirals did not close with the Spanish galleys and fight at close quarters. Never intending to ram or board, the British employed their heavier guns at great ranges and nibbled at the fringes of the Spanish Armada. The Spaniards valiantly fought terrible weather and the more sea-worthy English galleons, but Spain's seemingly invincible Armada went down in defeat. The British became the uncontested masters of the sea, and the galleon replaced the galley as the latest battleship.⁹ The English Navy continued to evolve as it expanded the Empire to the furthest reaches of the globe. Bigger ships-of-the-line with more sails, more guns, and more space for supplies replaced the galleons.

The American experience with battleships began with the first 74-gun ship-of-the-line built in North America appropriately named *America*.¹⁰ However, in an alarming precedent, the *America* was given to France in 1782 to replace a French ship lost in Boston Harbor.¹¹ The United States allowed itself to be dependent upon France for its protection. America's early leaders, though conscious of their fledgling nation's naval helplessness, did not feel they could raise enough revenue to justify investing in naval protection.

France's benevolence lasted until the period 1785 to 1795, when the British and French Navies, privateers, and Mediterranean corsairs preyed upon defenseless American ships.¹² Although still thrift conscious, the U.S. government could no longer ignore the threats to her commerce, and a modest "Frigate Navy" evolved around the famous *Constitution* and *Constellation*.¹³

As the immediate threat waned, so did the Navy. No new construction followed the "Frigate Navy" until the War of 1812 jolted the U.S. government awake. Massively outgunned and outmaneuvered by the British Fleet, the U.S. Navy responded with construction of the first true American ships-of-the-line in 1813. The Independence class warships employed 74 guns. The U.S. Navy had finally convinced Congress to authorize true battleships, but they could not be built and commissioned in time to serve during the war. The new battleships saw service in the Mediterranean and their impressive results convinced Congress to authorize a newer series of battleships, the North Carolina class. Many of the North Carolina class continued in service until and during the Civil War.¹⁴

Between the War of 1812 and the Civil War, naval innovations proceeded apace the evolution of technology in the private sector. Steam power, iron plating, increasingly strong metal alloys, and screw propulsion were all

experimental technologies which emerged during this period. However, the commencement of the Civil War provided the impetus to bring the new technologies to maturation. Both the Union and the Confederacy rushed to launch a new battleship which would rule the continent.

The South gained an early advantage by recovering the scuttled *U.S.S. Merrimac* from the Gosport Navy Yard at Portsmouth, Virginia.¹⁵ The *Merrimac's* formerly beautiful masts and superstructure were reduced to the waterline, and a new iron-plated gundeck completed the design that favored function over form.¹⁶ The new *Merrimac*, rechristened the *C.S.S. Virginia* but known forever as the *Merrimac*, boasted two 7-inch pivot guns, two 6.40-inch guns and six smoothbore 9-inch Dahlgrens. Well-armed and well-armored, the *Merrimac* had no equal on the Union side.¹⁷

The Union scrambled to catch up to the Confederate lead. A Navy Board on Ironclads approved three designs for immediate construction, the *New Ironsides*, the *Galena*, and the *Monitor*.¹⁸ A Swedish inventor, John Ericsson, promised the Board his "floating battery" would be more than a match for the *Merrimac*.¹⁹ The *Monitor*, the first ship of her kind, combined steam power, iron-plated armor, screw propulsion, a rotating turret capable of mounting the biggest guns of the day, engines below deck level, forced

air ventilation and several other patentable devices into the most potent vessel the world had ever seen.

The first readily recognizable ancestor of the modern battleship held up well in her baptism of fire. Earning no less than a draw on the tactical level, the *Monitor* clearly scored a decisive victory at the operational and strategic levels. The *Merrimac* left the *Monitor* in possession of the battlefield, and the Southern behemoth never again ravaged the Union's wooden ships. The Battle of Hampton Roads between the *Monitor* and the *Merrimac* attracted the world's attention.²⁰ All naval construction programs required reevaluation based on the results of the first battle between ironclads.²¹ Thirty of the *Monitor*'s direct descendants remained in service or under construction through 1883.²²

When the Civil War ended, the United States adopted its typical course and speed regarding naval development. The seven hundred ship fleet was pared to merely forty-eight active gun-mounting vessels by 1880. The U.S. Navy stood twelfth in the world, trailing Denmark, Chile and China.²³ As America turned inward to develop the country's interior, the Navy could only watch as it almost withered away. During the period 1883-1889, the Navy finally received funding to build some new ships. The new cruisers *Texas* and

Maine, and some smaller gunboats began the naval restoration process.²⁴

By 1890, Congress finally funded three true battleships. The *Oregon*, *Indiana*, and *Massachusetts* lead the program which carried the Navy to her new second place status among the world's navies by 1910.²⁵ The resurgent Navy and the conquest of all available continental frontiers made expansion-minded Americans look overseas for new challenges. The sinking of the *Maine* lead the U.S. into war with Spain in 1898. The Navy soundly defeated the Spanish, and the American public embraced their Navy as heroes.²⁶ Congress quickly authorized enough funding to build a new Navy with a legitimate battleship fleet. The U.S. Navy rose in size, stature and capability, but the Navy enjoyed its position for only a short time. The launch of the *H.M.S. Dreadnought* made all other ships obsolete in 1906.²⁷ Obsolete or not, President Roosevelt directed the voyage of the "Great White Fleet" around the world, in December 1907, to demonstrate American interest and resolve in free trade issues. Amid increasing European tensions, America chose to continue its naval build-up at a moderate pace of one or two battleships per year. When World War I broke, the U.S. Navy--even with its many battleships--was still inadequately prepared for war. President Wilson's administration

embarked on an aggressive program to build a fleet "equal to the most powerful maintained by any other nation in the world."²⁸

World War I did not provide any opportunities for the U.S. Navy's battleships to test their mettle, but the U.S. Fleet did yeoman service providing convoy escorts to ward off submarine attacks. The U.S. continued the naval construction program begun during the war, but in 1921 the Washington Conference convened to place limits on naval development. The United States invited Great Britain, France, Italy and Japan initially to discuss and agree upon naval ratios, tonnages and armaments. The U.S. and Great Britain emerged with the highest ratio, but Japan remained strongest in the Far East. France and Italy were insulted by their inferior, third-tier positions. The U.S. scrapped or stopped construction on eleven ships to achieve compliance. The treaty also prohibited battleship construction for a ten-year period, and it signaled the end of the battleship as the primary ship-of-the-line. Nations devoted their resources to building aircraft carriers and submarines. The London Conference of 1930 met to extend the limitations. Cruisers, destroyers and submarines came under review, but the results were less in favor of the U.S. and England. The Japanese delegation successfully argued for more favorable ratios. The signatories extended the

construction moratorium until 1936, but by that time, the Japanese Empire was expanding, and the Imperial Navy needed larger fleets to support the expansion. The Japanese Navy would not agree to any restrictions that might thwart its plans to enlarge Japan's sphere of influence. Only France, England and the U.S. agreed on the 1936 limits.²⁹ By 1938, it was obvious that Japan was building new battleships. The U.S. began designing and programming new ships of her own, but it continued to deploy her old battleships. Thus, many of the WW I vintage ships were lined up on "Battleship Row" when the Japanese struck Pearl Harbor in 1941.³⁰

The effect of the Japanese bombing of Pearl Harbor sobered the country and embarrassed the Navy. *Arizona* blew up and sank, *Oklahoma* capsized, *West Virginia* and *California* sank, *Nevada* was beached, and *Maryland*, *Tennessee*, and *Pennsylvania* suffered light to moderate damage. Air power had apparently triumphed over the battleships, but the preliminary results did not tell the whole story. The old battleships had been built to take a beating and survive. *Arizona* and *Oklahoma* were beyond rescue, but the Navy repaired and modernized the other six battleships. Air power advocates pointed to Pearl Harbor as proof of the airplane's ascendancy, but the attack against unprepared,

docked vessels accounted for the only U.S. battleship losses of the war.³¹ The battleship was not dead.

While acknowledging the rise of the aircraft carrier, the Navy continued to build and improve its battleship fleet. Ten new battleships joined the fleet between 1941 and 1944. The new battleships were fast, powerful and incredibly durable. The combination of 16-inch guns, 17 inches of armor, and 33 knots maximum speed made the battleships the most formidable warships ever built. They performed admirably in many roles during World War II, but their biggest contribution came in the naval gunfire role. Battleships, old and new, pounded the beaches prior to, during and after the Marines' and Army's major amphibious assaults. Attu & Kiska, Makin, Tarawa, Kwajalein, Peleliu, Normandy, Iwo Jima, and Okinawa all received thunderous gunfire support. All the battleships received the appropriate recognition when the U.S. chose the *Missouri* to be the platform for the Japanese surrender.³²

The advent of the atomic age, and the culmination of WW II signaled the demise of the battleship. The rise of the aircraft carrier and the submarine, and the promise of long-range missiles tipped with nuclear warheads seemed to negate the armor and firepower offered by even the Iowa class battleships. The Navy could not afford to continue manning and arming massive wartime fleets with the country

and the Congress anxious to return to peacetime appropriations. A rapid battleship decommissioning program rid the Navy of its underappreciated veterans. Museums, drydocks and scrapheaps claimed all the battleships save the *Missouri* by 1950.³³

When North Korea attacked South Korea, the *Missouri* responded. Her devastating firepower destroyed railroad bridges, marshaling yards, tank and troop concentrations and rolling stock. Congress quickly authorized the Navy to recommission the *Iowa*, *New Jersey*, and *Wisconsin*. The Iowa class ships wreaked destruction up and down the coasts of the Korean peninsula. The *Missouri* was the first battleship on the scene, and she alternated on and off station until April 1953. The *Iowa* fired mainly around the Wonsan area until 1952, and then she returned to the United States. The *New Jersey* also fired around the Wonsan area, but she remained in theater until November 1953. She and her crew won a Korean Presidential Unit Citation for their service. The *Wisconsin* returned from mothballs in 1951, and she served on the Korean gunline from November 1951 until March 1953.³⁴ The Iowas performed so effectively during the Korean Conflict that they earned a respite from retirement until 1957. Without any easily discernible threat, the Iowa class battleships again headed for mothballs and retirement.

By 1958, the U.S. Navy was without a true battleship for the first time since 1895.³⁵

During the 1960s, the world's militaries continued their pursuit of faster jet aircraft and guided missiles. The battleships were viewed as resource intensive anachronisms. Although many planners designed modifications to convert the Iowas to guided-missile ships, mini-carriers, and amphibious assault ships, the Navy never found the will nor the funds, during peacetime, to reactivate and convert the battleships.³⁶ Experiences in Vietnam spurred renewed interest in long-range, all-weather fire support delivered from naval platforms. Cruisers and destroyers were unable to neutralize lucrative targets inland because of the range and lethality limitations of 5-inch guns. The *New Jersey* steamed out of drydock again to take her place on the gunline along the Vietnamese coast in 1968. She pounded North Vietnamese troop concentrations north and south of the border, in all weather conditions, and she did it without jeopardizing any aircraft or pilots. In only 120 days of firing, she fired 10,000 rounds. However, her reactivation was short-lived. In 1969, the Secretary of Defense announced the impending decommissioning of the *New Jersey* because of funding restrictions.³⁷

As the world's last active battleship returned to mothballs in 1969, few observers pictured any further

service for the Iowas. The North Vietnamese resurrected the possibility of again reactivating the Iowas when they attacked into South Vietnam with conventional forces in 1972. President Nixon questioned the Navy about an express, 30-day reactivation for the *New Jersey*. Reluctantly responding, the Navy was unable to support the President's request. The heavy cruiser *Newport News* answered the call, but the Seventh Fleet Commander had wanted and needed the *New Jersey*. Some naval experts had recommended the Navy completely divest itself of the battleships in 1973 and papers to authorize disposal circulated, but common sense prevailed. The Navy decided to continue the minimal preservation efforts in case the Iowas were ever needed again.³⁸

Between 1974 and 1980, naval analysts conducted new studies and updated old studies concerning revisions and upgrades to the Iowa class battleships. In 1980 the Navy requested funds to reactivate the *New Jersey*, but funding restrictions prohibited the reactivation. When President Reagan's 1981 supplemental budget took effect, the *New Jersey's* funding came through. The Falkland Islands conflict of 1982 raised the interest in the Iowas' reactivation. Modern naval ships had shown their vulnerability to bombs and missiles. The Iowas' armor,

designed to take hits from 16 and 18-inch guns, would protect it from Exocet missiles. Secretary of the Navy John Lehman authorized the *New Jersey's* return to the fleet with some major modifications. The 16-inch main gun battery would remain, but Tomahawk and Harpoon missiles would join the arsenal. As the *New Jersey's* improvements and modifications continued, Congress approved additional funding to reactivate the *Iowa*. By 1988, all four of the *Iowas* once more roamed the seas in fighting shape.³⁹ The renovations were costly and time consuming, but the capability and power projected by the *Iowas* more than outweighed the time and money invested.

When the United Nations challenged Saddam Hussein's invasion of Iraq, the *Missouri* was part of the early Desert Shield buildup. When it came time to launch Desert Storm's initial strikes against Iraq's air defense network, the *Missouri* was ready and willing, but it was not the traditional main battery doing the firing. The *Missouri* launched twenty-eight Tomahawk cruise missiles in the opening days of the air campaign. Soon the *Wisconsin* also appeared in the Persian Gulf and both battleships pounded Iraqi positions along the coast and well inland. The combination of the 16-inch guns delivering fires and a remotely piloted vehicle (RPV) providing observation proved

devastating. Iraqi soldiers surrendered to the RPV rather than face more shelling from the battleships.⁴⁰ Both battleships performed well during the Persian Gulf War, but they could not be joined by the *Iowa* and *New Jersey*. Those two veterans were already on their way back into mothballs, and the *Missouri* and *Wisconsin* would soon leave active duty also. The most powerful ships ever built once again went quiet because of funding and manning shortfalls.

The history of the American battleship experience is an interesting but sad tale. America has designed and built some of the finest ships in the world, but the Navy and the Congress have repeatedly removed them from service at the earliest opportunity. From the *America* in 1782 to the final deactivation of the *Iowas* in 1992, perfectly good ships-of-the-line have consistently been given away or retired well before the expiration of their effective service life. The *Iowas*, planned and programmed before the attack on Pearl Harbor, are a testimony to the men (and women) who designed, engineered and built them. It seems ironic that they were deactivated again as the Navy was embracing a new focus on littoral warfare.⁴¹ What would be a better weapons delivery platform for a possible slugfest in the littorals than the most heavily armored and most heavily armed warships of all time? Torpedoes, Exocet

missiles and shore batteries would have a difficult time sinking an Iowa class battleship. These facts were not lost on Congress. The Navy knew it had to come up with a replacement for the Iowas, or it would continue responding to Congressional inquiries about the Iowas.⁴² Can the proposed arsenal ship be the successor to the battleship?

CHAPTER THREE

ARSENAL SHIP

--this thing could shoot ATACMS, Tomahawk and it's various varieties, standard missiles, or it could be a theater ballistic missile defense ammunition locker, and more. Admiral J.M. Boorda

"The arsenal ship concept is a direct outgrowth of the Navy's shift in focus from the open ocean to the littoral."⁴³ The arsenal ship appeared to burst upon the scene in 1996, but its genesis lies in the Navy's acknowledgment of the rise in priority of littoral operations.

In 1992, the U.S. Navy publicly announced its "landmark" shift, but in an ironic twist it also deactivated the most capable littoral warfare platforms ever built, the Iowa class battleships. As the Soviet Navy retreated to its harbors and dismantled itself, the U.S. Navy searched for relevancy in a confusing new world. Life was simpler when the Soviet Bear prowled the oceans. Without a clearly defined threat, America's Navy had to prepare for anything and everything. ...*From the Sea* represented the Navy's recognition of "the changing strategic landscape--away from having to deal with a global maritime threat and toward

projecting power and influence across the seas in response to regional challenges."⁴⁴

...From the Sea also recognized a change in Navy-Marine Corps relationships. The Navy realized Marines were necessary to project power ashore in littoral regions. To make the new naval doctrine plausible, the Marines and amphibious warfare would have to be elevated to a higher status. The Marines relished their importance, and they began to petition the Navy to address the most significant amphibious warfare challenges.⁴⁵ Amphibious ships were in short supply, countermine operations had been neglected for decades, a replacement helicopter for the aging CH-46 was still not in the budget, a replacement amphibious tractor for the AAVP-7 was necessary to speed up the landing process, and naval surface fire support had atrophied to the point of despair.⁴⁶ The Marines knew they had better capitalize on the current littoral attention before another attraction lured the Navy back to its traditional blue water focus.

While preparing for regional littoral challenges, the Navy examined a 1993 RAND Corporation study prepared for the Air Force, The New Calculus: Analyzing Airpower's Changing Role in Joint Theater Campaigns. The Navy gleaned that a major regional conflict (MRC) could present a threat target array consisting of up to 15,000 armor or mechanized

infantry fighting vehicles. The Navy further deduced a coalition force would have to neutralize one-third of the array to successfully halt an invasion force.⁴⁷ U.S. forces had no capability to stop a force of that dimension without allowing for a significant time delay to deploy forces. Realizing a potential foe may not provide the U.S. the time to build up combat power--as in Desert Shield--the Navy began its search for options to address the obvious shortfall.

A search for a new capability required a new platform. Aircraft carriers could launch strike missions against an enemy mechanized force, but a carrier air wing, or even two or three carrier air wings, could not produce enough attack sorties to blunt a 15,000 vehicle invasion. Vertical launch system (VLS) configured cruisers and destroyers could not launch enough Tomahawk cruise missiles to stop an array that large either. The cruisers and destroyers 5-inch guns did not have the range or lethality to seriously affect a substantial armor force.⁴⁸ Even applying carrier air, Tomahawks, and naval gunfire together would not produce the desired capability.

A solution to the problem would demand a new weapon system, but a new system would be difficult to acquire in the face of declining budgets, personnel cutbacks, and competing demands among the various branches

of the Navy. The surface, the submarine, and the aircraft carrier forces all had designs on procurement dollars. Even within the surface branch, the anti-air warfare community, the amphibious warfare community, the logistics community, the anti-submarine community, and the mine warfare community all had competing priorities. To build a consensus on any program, the Navy would have to try to satisfy as many communities as possible. To see the light of day, any new program must demonstrate more capability than any existing ship or combination of ships. The arsenal ship faces a difficult task. It will have to please everyone, to include the Marines, as well as Congress.

By 1993, even the Congressional Budget Office (CBO) recognized the Navy was woefully deficient in naval surface fire support assets. The CBO proposed, "Reactivating battleships may be the only option that could be carried out during the next few years to improve naval fire support."⁴⁹ The Navy knew it had to come up with a battleship replacement design, or it would face continued pressure to once again activate the Iowas. In 1994, rather than siphon off precious resources into designs from the pre-WW II era, the Navy searched for alternatives. One program looked at extending the range of existing 5-inch guns to allow the destroyers and cruisers to support ground forces on shore.⁵⁰ Another program examined converting Trident submarines to

Tomahawk shooters. These "stealth battleships" could be configured from submarines no longer needed in the nuclear triad concept.⁵¹ A third study came up with the arsenal ship idea.⁵² It would be the obvious successor to the battleship, but it would not be solely dedicated to replacing the battleship's 16-inch guns. The arsenal ship would be more.

The arsenal ship idea received a high priority from the Chief of Naval Operations Admiral J.M. Boorda. In an August 1995 interview, Admiral Boorda laid out the arsenal ship concept and explained his vision. Although reluctant to provide hard figures, Admiral Boorda established the year 2000 as a tentative delivery date for the first ship. He also admitted his role as the driving force behind the program, to include remarking he had heard the rumors that "this is Boorda's legacy."⁵³ Given the CNO's obvious interest, it was no surprise when the "Arsenal Ship Combat Systems Study" appeared in November 1995.

Conceived as a Fire Support Ship, the Arsenal Ship will serve primarily as a sea based, long-range strike and invasion stopping platform, providing direct maritime support of the land battle. On station, it will provide massive firepower early with little or no strategic warning. Capable of launching advanced long-range strike missiles equipped with submunitions [sensor-fuzed weapons (SFW), brilliant antitank (BAT) weapons, or wide-area mines (WAM)] this ship can deter mechanized invasions from outside the range of enemy land-based defenses.

Once friendly forces have gained a foothold ashore, both naval expeditionary and joint ground forces will require sustained on-call tactical strike and direct fire support during counter offensives. The Arsenal Ship, employing large numbers of extended range tactical missiles, can provide responsive support to forces ashore.⁵⁴

The arsenal ship program began as an extremely ambitious and at least mildly controversial concept. The original 1995 study listed the proposed arsenal ship roles in sequence: 1) long range strike and invasion stopping; 2) tactical strike and fire support; 3) battlespace dominance support - theater air defense (TAD) to include tactical ballistic missile defense.⁵⁵ To build one platform with the required capabilities would be an impressive feat, but potential contractors face other challenges also. The Navy also desires reduced manning, reduced acquisition and life-cycle costs, and reduced onboard target acquisition sensors.⁵⁶

In March 1996, the Navy and the Defense Advanced Research Projects Agency (DARPA) signed a joint agreement to execute the arsenal ship technology and demonstration program.⁵⁷ The Navy briefed Congress on the program and requested funding to match the milestones. By May 1996, the Joint Program Office had briefed industry, and had published the necessary documents to begin the proposal process.

The Arsenal Ship Capabilities Document (SCD) tasks industry to provide a technology demonstrator to show the

program is feasible within the established price thresholds. The demonstrator must have at least the basic capabilities, but does not have to possess the full capability of an arsenal ship. It must be able to demonstrate:

- 1) Performance of the mission for 90 days.
- 2) Required architecture, communications, and essential data links to support the Concept of Operations.
- 3) The capability for remote launch of strike, area Anti-Air Warfare (AAW) and fire support weapons.
- 4) That passive survivability will be sufficient for the expected operating scenarios.
- 5) The demonstrator must be capable of being converted to full mission capabilities and configuration and used as a fleet asset.⁵⁸

The SCD lists the additional capabilities the arsenal ship must possess. It must include the ability to fire weapons in support of a land campaign to fulfill the main roles analyzed in the Arsenal Ship Combat Systems Study, but the wording and emphasis is now refined. The primary role is still Long Range Strike followed by Invasion Stopping. The secondary role is Fire Support to Joint Ground Forces, and the tertiary role is now Tactical Ballistic Missile Defense and Air Superiority. The ship must have about 500 vertical launch cells, and it must be capable of launching all current and planned vertical launch

weapons. Finally, in a sop to ground forces, the ship must also have capacity reservations for future installation of an extended-range gun system.⁵⁹

To allow the arsenal ship to fire its impressive array of weapons it must be able to communicate, and it must be able to survive. To employ the Cooperative Engagement Capability (CEC) 'remote magazine' launch concept, the arsenal ship must possess a robust suite of communication data links, to include an over-the-horizon (OTH) satellite link. It must be able to communicate with other ships, aircraft, satellites, shore stations, joint force headquarters, and supported ground forces. To enhance its survivability, the arsenal ship will not carry its own targeting sensors. Without target acquisition radar, spotting personnel, or unmanned aerial vehicles (UAVs), the arsenal ship is blind. The arsenal ship is also dumb. All the requisite target acquisition capability, launch control and missile tracking data must come from another source. The arsenal ship will rely upon passive survivability techniques under the Aegis control umbrella.⁶⁰ The hull design should incorporate "stealth" technology to make it hard to find and difficult to hit. The ship must be "virtually unsinkable," and the design life of the ship must be at least 35 years.⁶¹

To be in position to fire its weapons, the arsenal ship must be mobile. It must be able to make a sustained speed of at least 22 knots using only 80% of its power. It must be capable of operating for up to 90 days without refueling, and it must demonstrate precise, continuous navigational control under any and all conditions--to include withstanding 100 knot winds and accompanying seas. It must also prepare to suffer moderate underwater damage with sufficient reserve buoyancy to continue with its mission. The arsenal ship's biggest challenge will be to perform all its required missions with a crew of no more than 50 people.⁶²

The SCD lists an impressive array of desired capabilities, but it stops short of telling industry exactly what to design and build. The requirements are challenging but straightforward, and the necessary technologies are either readily available, under development, or within reach in the near future. The SCD tells the technical side of the arsenal ship story, and the Concept of Operations (CONOPS) section covers the tactical employment options.

The Overview section of the CONOPS document contains some key verbiage that should attract contractor and Congressional attention. The Navy used that section to detail the arsenal ship concept, and to restate its position as the forward-deployed force of choice.

In the face of steadily decreasing overseas basing and a shrinking military budget, the United States must maintain the ability, in concert with allies, to execute timely combat operations across the spectrum of conflict. Naval forces, sustaining forward presence, will be key to successful introduction as well as early employment of ground forces. Arsenal ship represents an affordable and much needed enhancement to our existing force of carriers and land attack capable combatants and submarines. It is not a replacement for these or for land-based air. Instead, it is part of the whole--just as the Battleship was a part of the whole for nearly a century. . . . With a force totaling about six, arsenal ships will be stationed continuously forward, always available for rapid movement upon receipt of even ambiguous or limited strategic warning. Much like our maritime prepositioning force, they will remain on station in support of a Unified CinC for indefinite periods without dependence on host nation support or permission.⁶³

In one succinct paragraph, the Navy has said a mouthful. It acknowledges fiscal reality and the world's growing reluctance to host American armed forces. It pats itself on the back as an enabling force, graciously allowing the ground forces to arrive at their leisure. It reiterates the arsenal ship's affordability while avoiding a direct challenge of the air force. It attempts to retain the link to the battleship while also making reference to the highly successful maritime prepositioning program. The paragraph closes with the tie to the obvious warfighters, the Unified Commanders in Chief (CinCs) of the regional commands.

By July 1996, the Joint Program Office announced the interested Phase I contractors.⁶⁴ In spite of the ambitious requirements, five industry teams have formed to

bid on the arsenal ship program. They have six months to develop their designs. Two teams will receive funding to continue development before a final decision is made to choose one team to build a demonstrator. The arsenal ship program is clearly on the fast track. It is an innovative concept, but if it tries to be all things to all people, will it be able to do anything well? The CNO's vision of the arsenal ship "providing fire support to troops ashore, or to make it possible to get troops ashore"⁶⁵ will be difficult to balance against its other requirements.

CHAPTER FOUR

THE INEVITABLE COMPARISON

The Marine Corps is looking for Naval surface fires aboard as many ships as possible. We believe we need to break the paradigm that there is a particular ship that provides Naval surface fires.

Lieutenant General Paul K. Van Riper

The arsenal ship is clearly a controversial program. Critics and supporters do battle on a daily basis, in myriad forums. The obvious battle is for funding. In an already constrained fiscal environment, future programs must expect intense scrutiny from within the organization and from outside sources like Congress, the General Accounting Office and civilian budget watchdog groups. Comparisons between the arsenal ship and the Iowa class battleships are inevitable.⁶⁶ To achieve validity, the comparisons must be objectively grounded, and they must avoid emotional appeals. The key areas for evaluation are fire support capability, availability, and survivability.

An objective comparison between the fire support capability of an arsenal ship and an Iowa class battleship is extremely difficult to produce.⁶⁷ Although both platforms could contain guns and missiles, the weapons mixes are totally different and they reflect different outlooks.

The Iowas, in their current configuration, employ a main battery of nine 16-inch guns, twelve 5-inch guns in the secondary battery, thirty-two Tomahawk missiles, and sixteen Harpoon missiles.⁶⁸ This weapons mix provides a balanced attack with a primary focus upon great suppression or neutralization capability out to the range of the 16-inch guns. To engage targets with its main battery, an Iowa will need to deploy close to the shoreline, exposing it to coastal defenses. The Tomahawks extend the battleship's reach out to a much greater range, but the inability to reload while underway limits the amount of long-range striking power a battleship can generate.

The arsenal ship will employ a storehouse of up to 500 missiles, to possibly include advanced Tomahawk variants, Sea Launched Army Tactical Missiles (SLATACMS), and Stand-off Land Attack Missiles Expanded Response (SLAM-ER).⁶⁹ The arsenal ship may carry extended-range 5-inch guns, but their number will be limited due to space constraints. The arsenal ship's missile stockpile will allow it to strike deep with unprecedented power and accuracy.⁷⁰

The critical support criteria for this study is the vessels' ability to assist a landing force in a beach assault. A threat array makes evaluating the different ships' capabilities easier. Figures 1 and 2 depict two

possible scenarios. Both scenarios depict former Soviet units attempting a coastal defense. Both scenarios also demonstrate a defender's ability to deploy in depth, using prepared fighting positions. If a landing force attempted an amphibious assault against a defending enemy in a similar array, it would require tremendous amounts of firepower to suppress or neutralize the defenses. Many battleship advocates maintain that only a high-volume gun system can provide the type of fire needed by landing forces.⁷¹ Clearly, battleships have a decided edge over an arsenal ship when it comes to gun size and number of guns.

An arsenal ship could attempt to compensate for its lack of gunfire support by firing its missiles against the prepared defenses, but its effectiveness would be debatable. Current Tomahawk anti-ship missiles deliver a single thousand pound high-explosive warhead suitable for fixed-location point targets.⁷² Future versions will deploy multiple armor-seeking submunitions.⁷³ Neither version would be effective against infantry in prepared positions. SLATACMS could suppress a target, but to continually suppress an entire target set, SLATACMS missiles would be prohibitively expensive, hence the seemingly tacked-on requirement for an extended-range 5-inch gun. Over the course of an amphibious assault, not even an arsenal ship could carry enough missiles to answer every call for fire

with a missile. While an arsenal ship is not the ideal system for beach assault support, its value increases markedly as landing forces move inland.

Beyond the beach defenses lurks an extremely dangerous threat to a landing force, an armor heavy counterattack force. Here the advantage shifts to the arsenal ship. Improved Tomahawks, SLATACMS with Brilliant Anti-Tank (BAT) munitions and SLAM-ERs are capable of disrupting or neutralizing an armor unit before it can engage a landing force. A battleship cannot carry the number of Tomahawk missiles necessary to counteract an armor brigade or larger force. Under ideal conditions, 16-inch guns could temporarily disrupt an armor force, but guns are relatively short-range weapons when compared to the 100+ kilometer ranges for missiles.

Assessing the availability criteria is relatively easy. Only two battleships remain easily accessible for reactivation.⁷⁴ Theoretically, other battleships could be reacquired from their resting places as floating monuments, but a realistic assessment discounts this possibility. If the Navy decided to reactivate the battleships, it would require another trip to the drydocks for refurbishing. Past reactivations have taken a year or two per ship to resurrect and enhance the battleship's capabilities. The further the Navy tries to stretch the battleships, the more difficult it

is to bring them up to current capabilities. Historically, improvement processes have been frustrated by the antiquated ship design and construction materials. To radically modify the battleships as suggested by some advocates' plans, would be exceptionally difficult, expensive and questionable in their effectiveness. Besides the cost of reactivation and the continued cost of operating a fifty-five year-old vessel, the most expensive part of the reactivation equation is the manpower. Manning the battleships with the required crew of 1,500 would be very difficult for the Navy to manage.⁷⁵ For much of the Navy, it is difficult to fathom why they should divert resources to an obviously antiquated platform. When Ticonderoga class cruisers and Arleigh Burke class destroyers only need around 300 sailors, it is hard to justify 1,500 men and women on one battleship.⁷⁶ One of the arsenal ship's key requirements is to man it with 50 or fewer sailors. This is an attractive feature, but some observers question the feasibility of the arsenal ship's stated manning level.

One of the arsenal ship's biggest critics, William Stearman, questions many of the program's promises. He doubts a crew of 50 can perform the necessary maintenance to keep an arsenal ship afloat and operable.⁷⁷ The arsenal ship study found the goal achievable by offloading the requirement to acquire targets, select weapons and compute

firing solutions. The remote launch concept could make the manning goal possible and keep the arsenal ship lean, but industry must demonstrate how lean the arsenal ship can be while still successfully performing its mission. Whatever the final manning level becomes, the arsenal ship program promises more vessels than there are remaining battleships. The ideal ship mix would be six total vessels. Three would be continually at sea and three would rotate off-station for rest and maintenance. The Navy identified the key stations as "European Command (Mediterranean Sea), Central Command (Persian Gulf), and Pacific Command (Western Pacific)." ⁷⁸ The availability criteria clearly favors the arsenal ship, but availability can be affected by survivability.

To deliver its fire support, a vessel must be capable of surviving the many threats it faces. Torpedoes, mines, anti-ship missiles, coastal artillery and dumb bombs are all possible threats for a naval surface fire support platform. The Iowas have proven their ability to take punishment and continue the mission. The arsenal ship will not be able to rely on the battleship's seventeen inches of armor. The arsenal ship eschews thick armor protection in favor of a radar evading "stealthy" design to avoid detection. However, firing up to 500 missiles defeats passive techniques and "stealthy" design, so the arsenal ship must prepare to receive some hostile fire. ⁷⁹ The SCD

requires the arsenal ship to be "virtually unsinkable," but what does that mean? The *Titanic* was thought to be unsinkable, but it never completed its maiden voyage. Trying to design and build an unsinkable arsenal ship featuring up to 500 missiles may be impossible. Industry will have to demonstrate just how survivable an arsenal ship can be,⁸⁰ but even the best designs will probably not approach the battleship's impressive ability to absorb punishment and continue the mission.

It becomes clear that arguing battleship against arsenal ship is similar to comparing apples and oranges. They should not be viewed as competitors. Although worlds apart in age, purpose and capability, they are clearly related. In an initial amphibious assault, the battleship is superior at providing massive amounts of suppressive fire. However, when the landing force attempts to consolidate its beachhead and push inland, it could face an extremely dangerous armor counterattack. The arsenal ship would be the platform of choice for disrupting the counterattack. Both vessels in support of a landing force would be the ideal, however, constrained budgets prohibit this option.

The Iowa class battleships cannot be replaced in kind, but the future of naval surface fire support is clearly the arsenal ship. However, the future should not be

the arsenal ship alone. All the Navy's 5-inch guns should be upgraded to the extended-range version, and the arsenal ship should continue to receive high-profile interest and high-priority support from Naval and Congressional leaders. Even hinting at reactivating the battleships creates a strong emotional response from proponents and opponents, but the issue is now almost a moot point. The Navy shows little interest in reactivating the battleships, and with the arsenal ship program underway, Congress appears content to let the naval surface fire support issue rest.

The arsenal ships may not be the perfect platform to support troops in an amphibious assault against a determined enemy, but they will provide CinCs and landing forces with an unprecedented amount of firepower from a naval surface vessel. Air support, naval gunfire from many ships, and an arsenal ship's missiles could be the key to effective 21st-Century operations in the littoral regions of the world.

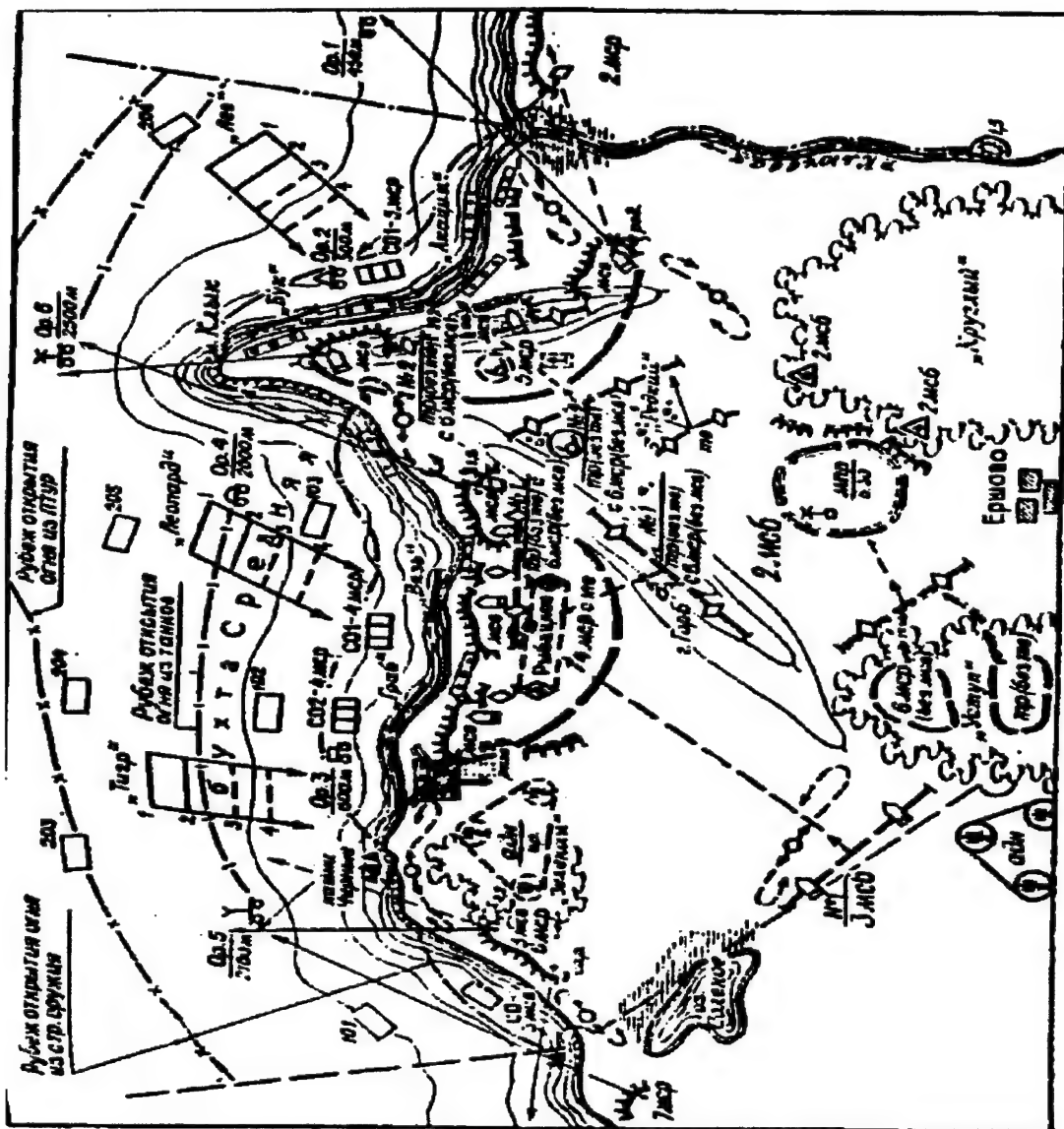


Fig. 1. A Battalion in a Coastal Defense. Armor counterattack force is positioned in the lower right corner of the diagram, directly in front of the artillery battalion. This figure only depicts one battalion in the defense. If a brigade or division established a coastal defense, it would present a target rich environment that would be difficult to neutralize with missiles alone. Reprinted, by permission, from Soviet Military Herald, Jan 1984.

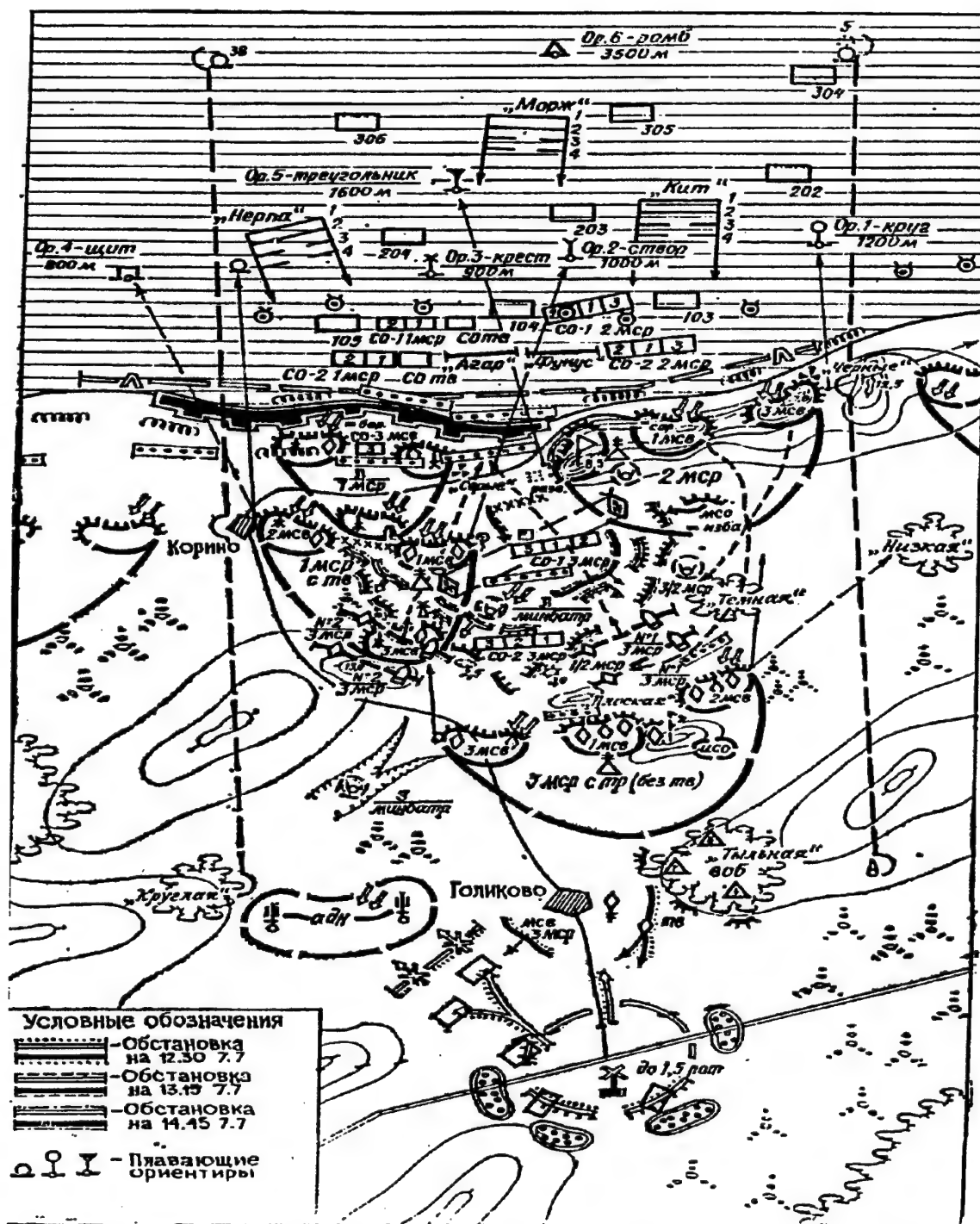


Fig. 2. A battalion defending a coastline along a narrow frontage. A concentrated defense presents another target rich environment. Missiles dispensing anti-personnel munitions could be effective against this defense. Reprinted, by permission from Soviet Military Review September 1989.

ENDNOTES

¹ Mike Boorda quoted by Jon P. Walman in "The New Generation of Combatants," Surface Warfare, 20, no. 6, (November/December 1995): 7.

² Alan Morehead, Gallipoli, (New York: Harper & Row, Publishers, Inc., 1956), 141.

³ Ernest Blazaar, "Battleships Aren't Dead Yet," Navy Times, 44, no. 33, (22 May 1995): 25.

⁴ Defense Advanced Research Projects Agency, "Arsenal Ship - Main Page," <<http://www.darpa.mil/asjpo/>>; <http://www.darpa.mil/asjpo/documnts.html>; http://www.darpa.mil/asjpo/solicitation/docs/pc_att1.zip CONOPS; http://www.darpa.mil/asjpo/solicitation/docs/pc_att1.zip SCD, November 1996.

⁵ U.S. Navy, The Battleship in the United States Navy, (Washington: U.S. Naval History Division, 1970), 3.

⁶ Richard Humble, Naval Warfare: An Illustrated History, (New York: St. Martin's Press, 1983), 9-12.

⁷ E.B. Potter, Sea Power, (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1960), 3-5.

⁸ Humble, Naval Warfare: An Illustrated History, 38-42.

⁹ Potter, Sea Power, 27-30.

¹⁰ U.S. Navy, The Battleship in the United States Navy, 4.

¹¹ U.S. Navy, The Battleship in the United States Navy, 4.

¹² U.S. Navy, The Battleship in the United States Navy, 5.

¹³ Carroll Storrs Alden and Allen Westcott, The United States Navy: A History, (Chicago: J.B. Lippincott

Company, 1943), 41-61 passim; U.S. Navy, The Battleship in the United States Navy, 5.

¹⁴ U.S. Navy, The Battleship in the United States Navy, 5-7.

¹⁵ William Chapman White and Ruth White, Tin Can on a Shingle, (New York: E.P. Dutton & Company, Inc., 1957), 10-11.

¹⁶ Alexander A. Hoehling, Thunder at Hampton Roads, (New York: Da Capo Press, 1993), 32-35, 38-41; White and White, Tin Can on a Shingle, 16.

¹⁷ James Phinney Baxter, The Introduction of the Ironclad Warship, (Cambridge, MA: Archon Books, 1968), 229; White and White, Tin Can on a Shingle, 16; Hoehling, Thunder at Hampton Roads, 56.

¹⁸ White and White, Tin Can on a Shingle, 22-23.

¹⁹ White and White, Tin Can on a Shingle, 46.

²⁰ Alden and Westcott, The United States Navy: A History, 171.

²¹ White and White, Tin Can on a Shingle, 152.

²² White and White, Tin Can on a Shingle, 153; Hoehling, Thunder at Hampton Roads, 194.

²³ Alden and Westcott, The United States Navy: A History, 281.

²⁴ Brayton Harris, The Age of the Battleship, 1890-1922, (New York: Franklin Watts, Inc., 1965), 6-8.

²⁵ Potter, Sea Power, 344.

²⁶ Harris, The Age of the Battleship, 1890-1922, 103.

²⁷ Potter, Sea Power, 388.

²⁸ Harris, The Age of the Battleship, 1890-1922, 153.

²⁹ Alden and Westcott, The United States Navy: A History, 370-375.

³⁰ Harris, The Age of the Battleship, 1890-1922, 394-395; U.S. Navy, The Battleship in the United States Navy, 22.

³¹ U.S. Navy, The Battleship in the United States Navy, 22.

³² Potter, Sea Power, 835.

³³ U.S. Navy, The Battleship in the United States Navy, 37.

³⁴ William H. Garzke, Jr. and Robert O. Dulin, Jr., Battleships: United States Battleships, 1935-1992, (Annapolis, MD: Naval Institute Press, 1995), 120, 128, 134, 203, 276.

³⁵ Garzke and Dulin, Battleships: United States Battleships, 1935-1992, 134.

³⁶ Henry Wyatt, "Retain the Iowas...As They Are," United States Naval Institute Proceedings, 121, no. 11, (November 1995): 75.

³⁷ Garzke and Dulin, Battleships: United States Battleships, 1935-1992, 128-129; U.S. Navy, The Battleship in the United States Navy, 39-40.

³⁸ Garzke and Dulin, Battleships: United States Battleships, 1935-1992, 212-213.

³⁹ Ronald M. Spector, Operational Experience of Fast Battleships: World War II, Korea, Vietnam, (Washington: U.S. Navy Historical Center, 1989), iii.

⁴⁰ Garzke and Dulin, Battleships: United States Battleships, 1935-1992, 239, 242.

⁴¹ U.S. Navy, Naval Doctrine Publication 1: Naval Warfare, (Washington: Department of the Navy, 1994), 16.

⁴² Ernest Blazar, "Battleships Aren't Dead Yet," Navy Times, 44, no. 33, (22 May 1995): 25.

⁴³ DARPA, "Concept of Operations (CONOPS), attachment 1 to Arsenal Ship Program Solicitation 23 May 1996," http://www.darpa.mil/asjpo/solicitation/docs/pc_att1.zip, November 1996.

⁴⁴ U.S. Navy, "Forward ...From the Sea," Navy Public Affairs Library (NAVPALIB), <http://www.navpalib@opnav-emh.navy.mil>, November 1996.

⁴⁵ Congressional Budget Office, CBO Staff Memorandum: Selected Options for Enhancing Naval Capability in Regional Conflicts, (Washington: CBO, 1993), iv.

⁴⁶ David Silverstein, "As Military is Cut, America Still Needs the Marines," The Heritage Foundation Backgrounder, no. 871, (13 January 1992): 11-12.

⁴⁷ U.S. Navy, Arsenal Ship Combat Systems Study, (Dahlgren, VA: Naval Surface Warfare Center, 1995), 1.

⁴⁸ CBO, CBO Staff Memorandum: Selected Options for Enhancing Naval Capability in Regional Conflicts, viii.

⁴⁹ CBO, Selected Options for Enhancing Naval Capability in Regional Conflicts, viii.

⁵⁰ Silverstein, "As Military is Cut, America Still Needs Marines," Backgrounder, no. 871, 12.

⁵¹ Ernest Blazar, "Mother of Invention: Do With Less," Navy Times, 45, no. 13, (1 January 1996): 28.

⁵² U.S. Navy, Arsenal Ship Combat Systems Study, 1.

⁵³ U.S. Navy, "Transcript of an Interview with Admiral J.M. Boorda Chief of Naval Operations," <<http://www.ncts.navy.mil/navpalib/ships/arsenal/boor0824.txt>>, October 1996.

⁵⁴ U.S. Navy, Arsenal Ship Combat Systems Study, 7.

⁵⁵ U.S. Navy, Arsenal Ship Combat Systems Study, 8.

⁵⁶ U.S. Navy, Arsenal Ship Combat Systems Study, 9.

⁵⁷ Defense Daily, "Navy, DARPA Ink Agreement for Arsenal Ship," <www.phillips.com.defense/dd/dd032101.html>, October 1996.

⁵⁸ DARPA, "Arsenal Ship Capabilities Document (SCD)," http://www.darpa.mil/asjpo/solicitation/docs/pc_att1.zip SCD, November 1996, 1.2.

⁵⁹ DARPA, "Arsenal Ship Capabilities Document (SCD)," 2.0-2.2.

⁶⁰ DARPA, "Arsenal Ship Capabilities Document (SCD)," 2.3; DARPA, "Arsenal Ship Concept of Operations," Overview.

⁶¹ DARPA, "Arsenal Ship Capabilities Document (SCD)," 2.3.

⁶² DARPA, "Arsenal Ship Capabilities Document (SCD)," 2.4-3.2.

⁶³ DARPA, "Arsenal Ship Concept of Operations," Overview.

⁶⁴ DefenseLink News, "Arsenal Ship Program Selects Phase I Contractors," <www.dtic.dla.mil/defenseLink/news/Jul96/b071196_bt422-96.html>, October 1996.

⁶⁵ U.S. Navy, "Transcript of an Interview with Admiral J.M. Boorda Chief of Naval Operations," Answer# 20, <<http://www.ncts.navy.mil/navpalib/ships/arsenal/boor0824.txt>>, October 1996.

⁶⁶ Ernest Blazar, "Battleships Aren't Dead Yet," Navy Times, 44, no. 33, (22 May 1995): 25.

⁶⁷ Edward A. Smith, "Naval Firepower for the 21st Century," Washington Post, 27 July 1996, 22.

⁶⁸ Garzke and Dulin, Battleships: United States Battleships, 1935-1992, 217, 252, 277.

⁶⁹ Jon P. Walman "The New Generation of Combatants," Surface Warfare, 20, no. 6, (November/December 1995): 7.

⁷⁰ Davy Jones quoting Joseph Metcalf in "Vessel Could Mean New Direction For Surface Warfare," The Campus News, May 1996, 1.

⁷¹ Robert C. Peniston and Robert W. Selle, "Gunfire to Get Them Off the Beach," The Washington Post, 14 August 1996, A20.

⁷² Garzke and Dulin, Battleships: United States Battleships, 1935-1992, 252.

⁷³ Edmund R. Anderson et. al., "TSTAR: Tomahawk Stops the Attacking Regiments," Surface Warfare, 21, no. 2, (March/April 1996): 13.

⁷⁴ Norman Polmar, "The Navy's Proposed Arsenal Ship: Pro," The Retired Officer Magazine, 52, no. 11, (November 1996): 40.

⁷⁵ Blazar, "Battleships Aren't Dead Yet," 25.

⁷⁶ Ernest Blazar, "Mother of Invention: Do With Less," Navy Times, 45, no. 13, (1 January 1996): 28.

⁷⁷ William L. Stearman, "The Navy's Proposed Arsenal Ship: Con," The Retired Officer Magazine, 52, no. 11, (November 1996): 39.

⁷⁸ DARPA, "Concept of Operations (CONOPS)," Operational Assumptions.

⁷⁹ Greg Pickell, "Fire Support: View From the Foxhole," The Washington Post, 11 July 1996, A24.

⁸⁰ U.S. Navy, "Ship Capabilities Document (SCD)," 2.4.

SELECTED BIBLIOGRAPHY

Articles

- Andrienko, Vasily. "Battalion In Coastal Defence." Soviet Military Review. (January 1989): 26,46.
- Ange, Chris. "Naval Surface Fire Support: 5-Inch Mk 45 Gun Mount Modifications." Surface Warfare. 21, no. 3. (May\June 1996): 2-6.
- Blazar, Ernest . "Battleships Aren't Dead Yet." Navy Times. 44, no. 33. (May 22, 1995): 25.
- _____. "Future Shock." Navy Times. 45, no. 38. (July 29, 1996): 12-14.
- _____. "Mother of Invention: Do With Less." Navy Times. 45, no. 13. (January 1, 1996): 28.
- _____. "Ships With Two Points of View." Navy Times. 44, no. 48. (September 4, 1995): 22.
- Boorda, Jeremy Mike. "An Interview with Adm. Mike Boorda." Surface Warfare. 21, no. 2. (March\April 1996): 2-4.
- Gourley, Scott. "Arsenal Ship." Popular Mechanics. (June 1996): 58-60.
- Jane's Navy International. "Budget Squeeze Blurs the Long-Range Vision." (June 1996): 1,2, 31-34.
- Jones, Davy. "Retired Surface Warrior Details New Arsenal: Vessel Could Mean New Direction For Surface Warfare." The Campus News. (Monterey, CA: Naval Postgraduate School). (May 1996): 1.
- Kokhanov, V. "Antilanding Defence." Soviet Military Review. (August 1972): 14-17.
- Luddy, John. "Charting a Course for the Navy in the 21st Century." Heritage Foundation Backgrounder. No. 979, (March 9, 1994): 1-14.

- Lyons, Kenneth T. "Extended Range Guided Munitions." Surface Warfare. 21, no. 3. (May\June 1996): 8-11.
- Mackin, J. G. et. al. "Systems Impact of Extended Range Guns for NSFS." Paper presented at ASNE Symposium-1995, Mississippi Coast Coliseum & Convention Center, (16-17 February 1995).
- Morrall, Dennis. "Naval Surface Fire Support: Fire Support Missile Options." Surface Warfare. 21, no. 3. (May\June 1996): 12-13.
- Norton, Scott. "Naval Surface Fire Support Advanced Technologies." Surface Warfare. 21, no. 3. (May\June 1996): 14-21.
- Phillips, Mark D. and Kevin M. Norman. "BB's Big Guns Blast Away." Surface Warfare. 16, no. 2. (March\April 1991): 16-17.
- _____. "Tomahawk Strike." Surface Warfare. 16, no. 2. (March\April 1991): 8-13.
- Pickell, Greg. "Fire Support: The View From the Foxhole." The Washington Post. 14 August 1996, A20.
- Polmar, Norman and William L. Stearman. "The Navy's Proposed Arsenal Ship: Pro and Con." The Retired Officer. 52, no. 11. (November 1996): 36-41.
- Sabalos Jr., Nicholas, ed. "An Interview With Lt.Gen Paul K. Van Riper Commanding General, Marine Corps Combat Development Center." Surface Warfare. 21, no. 3. (May\June 1996): 30-31.
- Samigulin, K. "Coastal Defence," Soviet Military Review. (September 1977): 22-23.
- Selle, Robert W. "Gunfire to Get Them Off the Beach." The Washington Post. 14 August 1996, A20.
- Serig, Howard W., Jr. "The Iowa Class: Needed Once Again." U.S. Naval Institute Proceedings. 108. (May 1982): 134-149.
- Silverstein, David. "As Military is Cut, America Still Needs the Marines." The Heritage Foundation Backgrounder. Number 871. (13 January 1992): 1-14.

Smirnov, V. "A Battalion in a Coastal Defense." Soviet Military Review. (January 1984): 30-33.

Stearman, William Lloyd. "A Misguided Missile Ship". The Washington Post. July 7, 1996, 18.

Trainor, Bernard. "Anchors Awry: How to Fix the Sinking Navy." The Washington Post. May 26, 1996, C01.

Walman, Jon P. "The New Generation of Combatants: SC-21, Arsenal Ship Reflect 21st-Century Vision." Surface Warfare. 20, no. 6. (Nov\Dec 1995): 6-8.

Books

Alden, Carroll Storrs and Alan Westcott. The United States Navy: A History. Chicago: J.B. Lippincott and Company, 1943.

Baxter, James Phinney. The Introduction of the Ironclad Warship. Cambridge, MA: Archon Books, 1968.

Beach, Edward L. The United States Navy: 200 Years. New York: Henry Holt and Company, 1986.

Bowie, Christopher et al. The New Calculus: Analyzing Airpower's Changing Role in Joint Theater Campaigns. Santa Monica, CA: RAND, 1993.

Garzke, William H Jr. and Robert O. Dulin. Battleships: United States Battleships, 1935-1992. Annapolis, MD: Naval Institute Press, 1995.

Gregson, Barry. Amphibious Operations. London: Blandford Press, 1988.

Grove, Eric. The Future of Sea Power. Annapolis, MD: Naval Institute Press, 1990.

Harris, Brayton. The Age of the Battleship 1890-1922. New York: Franklin Watts, Inc., 1965.

Hastings, Max and Simon Jenkins. The Battle for the Falklands. New York: W.W. Norton and Company, 1983.

Hoehling, A.A. Thunder at Hampton Roads. New York: Da Capo Press, 1976.

- Hough, Richard. Death of the Battleship. New York: The Macmillan Company, 1963.
- Humble, Richard. Naval Warfare: An Illustrated History. New York: St. Martin's Press, 1983.
- Keaney, Thomas A. and Eliot A. Cohen. Gulf War Air Power Survey Summary Report. Washington: U. S. Government Printing Office, 1993.
- Keegan, John. The Price of Admiralty. New York: Penguin Books, 1988.
- Legg, Stuart. Jutland: An Eyewitness Account of a Great Battle. New York: The John Day Company, 1967.
- Moorehead, Alan. Gallipoli. New York: Harper & Row, 1956.
- Morrison, Samuel Eliot. Victory in the Pacific 1945. Boston: Little, Brown and Company, 1975.
- Potter, E.B. Sea Power - A Naval History. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1960.
- Reilly Jr., John C. Operational Experience of Fast Battleships; World War II, Korea, Vietnam. Washington: Naval Historical Center, 1989.
- White, W.C. and Ruth. Tin Can on a Shingle. New York: E.P. Dutton Company, 1957.

Government Documents

- Committee on Armed Services House of Representatives. Reactivation of Battleships. Washington: Government Printing Office, 1983.
- Congressional Budget Office. CBO Staff Memorandum: Selected Options For Enhancing Naval Capability in Regional Conflicts. Washington: Congressional Budget Office, 1993.
- Department of Defense. Conduct of the Persian Gulf War: Final Report to Congress. Washington: Government Printing Office, 1992.
- U.S. Army. FM 6-20 Fire Support in the AirLand Battle. Washington: Department of the Army, 1988.

U.S. Navy. The Battleship in the United States Navy.
Washington: U.S. Naval History Division, 1970.

_____. Force 2001: A Program Guide to the U.S. Navy.
Washington: Deputy Chief of Naval Operations Resources,
Warfare Requirements and Assessments (N8), 1995.

_____. Forward...From The Sea. Washington: Department
of the Navy, 1994.

_____. ...From The Sea: Preparing the Naval Service for
the 21st Century. Washington: Department of the Navy,
1992.

_____. Naval Doctrine Publication 1: Naval Warfare.
Washington: Department of the Navy, 1994.

_____. NWP 22-2 (Rev. C) Supporting Arms in Amphibious
Operations. Norfolk, VA: Naval Doctrine Command, 1993.

_____. NWP 3-09.11M Supporting Arms in Amphibious
Operations. Norfolk, VA: Naval Doctrine Command, 1995.

Unpublished Materials

Defense Advanced Research Projects Agency and U.S. Navy.
"Arsenal Ship Program - Main Page." <<http://www.darpa.mil/asjpo/>>. Joint Program Office, September 1996.

_____. "Arsenal Ship Program Documents." <<http://www.darpa.mil/documents.html>>. Joint Program Office,
September 1996.

_____. "Arsenal Ship Program Introduction."
<http://www.darpa.mil/asjpo/docs/pcmays_p1.zip>. Joint
Program Office, September 1996.

_____. "Arsenal Ship Program Acquisition Overview."
<http://www.darpa.mil/asjpo/docs/pcmays_p2.zip>. Joint
Program Office, September 1996.

_____. "Arsenal Ship Program Concept of Operations."
<http://www.darpa.mil/asjpo/docs/pcmays_p3.zip>. Joint
Program Office, September 1996.

_____. "Arsenal Ship Program Description." <http://www.darpa.mil/asjpo/docs/pcmays_p4.zip>. Joint Program
Office, September 1996.

_____. "Arsenal Ship Program Phase I Kickoff Plans." http://www.darpa.mil/asjpo/docs/pcmays_p5.zip. Joint Program Office, September 1996.

_____. "Arsenal Ship Program Section 845 Review." http://www.darpa.mil/asjpo/docs/pcmays_p6.zip. Joint Program Office, September 1996.

Defense Technical Institute Center. "Arsenal Ship Program Selects Phase I Contractors." http://www.dtic.dls.mil/defenseink/news/Jul96/b071196_bt422-96.html. Department of Defense, August 1996.

Jordan, Michael W. "Soviet Antilanding Doctrine: Does it Matter?" Monterey, CA: Naval Postgraduate School, 1991.

Meeker, Thomas J. "The Tomahawk Land Attack Cruise Missile and the Missions of the United States Navy." Monterey, CA: Naval Postgraduate School, 1982.

Palermo, Anthony J. "Exploiting the Soviet Antilanding Defense With Amphibious Maneuver." Newport, RI: Naval War College, 1987.